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ABSTRACT

A study examined the effects of using children's literature to introduce new science concepts to kindergarten children. Subjects, 48 kindergarten students, were arbitrarily assigned to either the control group or the experimental group. The experimental group was taught a unit on oceans using children's literature to introduce the science concepts. The control group was taught the same unit using only class discussion. Treatment sessions for both groups lasted three weeks. Comparison of pretests and posttests indicated that there was no significant difference in science achievement of students who were taught using children's literature and those who were not. (Two tables of data are included; 25 references, the testing instruments, the instructional unit, an appendix of data, and statistical formulas are attached.) (RS)

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The Effects of Integrating Children's Literature into the Kindergarten Science Curriculum

By

Lenora Kamer Norris

A Research Project Report

Presented in Fulfillment of the Requirements for the Specialist's Field Problem Course in the Graduate Program of Education at Mercer University in Atlanta

Atlanta, Georgia

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ABSTRACT

The Effects of Integrating Children's Literature Into the Kindergarten Science Curriculum

By

Lenora Kamer Norris

Purpose

The purpose of this study was to determine the effects of using children's literature to introduce new science concepts to kindergarten children.

Methods and Procedures

Forty-eight kindergarten students in two intact classes were assigned to two treatment groups. The experimental group was taught a unit on oceans using children's literature to introduce the science concepts. The control group was taught the same unit without using children's literature; the teacher introduced the same concepts in class discussions. Treatment sessions for both groups lasted three weeks. The same testing instrument was administered to both groups on the first day as a pretest and on the last day

as a posttest. Data were collected and a *t*-test was utilized to test the difference between the gain scores for the pretest and the posttest for both groups.

Results

According to the results of this study, there was no significant difference in science achievement of students who were taught using children's literature and those who were not.

Conclusions

The statistical data indicated that using children's literature to teach science concepts did not lead to higher achievement in science. Since the results of this study contradict most research in the area of integrating literature with science, further research is needed to identify the most effective method of instruction.

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SECTION I

Introduction

Research shows that teachers unfortunately feel inadequate in science instruction and therefore limit the amount of time they spend in this subject area. They also feel there is not enough time to teach science and therefore science instruction continues to suffer (Gates, 1988, cited in Butzow, 1988).

Today is the age of high technology and space exploration. How can students be prepared to face society with such limited science experience? Will technology continue to develop if there is no one to develop it? It is frightening to think about the answers to these questions, but when one does, one realizes that something has to be done about the quality of science instruction if we are to continue to grow and prosper as a nation.

Up to half of the elementary school day is spent on language arts. It makes sense to try to integrate science with language arts in order to maximize the teaching time. Many teachers are confident and feel comfortable with language arts instruction. The teacher is no longer teaching

reading in isolation but along with content matter in the various disciplines (Butzow, 1988).

There is an abundance of good children's literature available in the area of science. It is logical to develop a curriculum in science using this resource since it would increase science instruction time as well as making laguage arts instruction more meaningful.

Problem Statement

The purpose of this study was to answer the following question: Is there a significant difference in mean scores on a science achievement test for kindergarten students who are taught science concepts using children's literature and those who are not?

Assumptions

The following assumptions were made prior to conducting the study:

1. The two groups were equivalent in ability as measured by the Gwinnett County Assessment Test for kindergarten students.
2. The measuring instruments were valid and reliable measures of the science

achievement level of the students.

3. Daily attendance was stable throughout the study.
4. Class populations would remain the same throughout the study.

Delimitations

The delimitations for the study were:

1. The study was completed in three weeks.
2. The study was limited to 48 students divided into two kindergarten classes.
3. The study was limited to two ways of teaching a science unit.
4. The control and experimental groups were taught by two different teachers.

Definition of Terms

For the purpose of this study, the following terms are defined.

1. Achievement: "Something carried out successfully" (Webster, 1988, p.6). For this study, it will be measured by a teacher-made test covering the science unit on oceans (see Appendix A).
2. Integrate: "To make into a whole; unify"

(Webster, 1988, p.502). For this study, literature will be integrated with the science curriculum.

Summary

Integrating literature with the science curriculum seems to be a viable alternative to using science textbooks and teacher lectures. Children with limited reading skills as well as those with advanced skills could excel in science. Teachers who feel weak in the area of science could combine science with language arts, an area they are more likely to feel strong in. This study will determine if integrating children's literaure with a science curriculum will make a difference in the students' achievement.

SECTION II

Introduction

In reviewing literature related to the study presented in this paper, Piaget's name comes up quite often. His theories of how children learn are applied to many of the curriculum programs. His theories include: a) how science activities should be sequenced; b) how we should teach science; and c) the contents of what should be taught (Elkind, 1972).

Piaget's Theory

Piaget's theory of intellectual development deals with the mind developing in a sequence of stages related to age. Even though the sequence remains the same for all children, the rate at which they pass through each stage may differ, depending on their evironment as well as their genetic endowment.

Elkind (1972) dicusses Piaget's stages and what they mean. In the first stage, the sensory-motor stage, intelligence is defined as the ability to accomplish some task. At this stage the child solves problematic situations by

experimenting and acting upon rather than by a mental process. This stage lasts from birth until about age two. The next stage is preoperational and begins around two and lasts until about age seven. In this stage the child acquires language and begins to understand signs and symbols as representations of the real world. Logical thought is developed in the third stage, the concrete operational stage. This usually begins around age seven. Conservation is also understood by the child in this stage. Conservation is the idea that essential properties of things do not change when superficial properties of things are changed. The final stage is formal operational which begins around age eleven. Here the child begins to think abstractly and make predictions (Heddens, 1987).

How Children Learn

These stages of development parallel the development of any science. Elkind (1972) suggests, based on Piaget's theories, that we begin science instruction with teaching children how to observe. This is not simply watching something but training the child to focus his observations. The child needs to learn to look

for similarites and differences among the things he is observing. It is also important to provide a wide variety of materials for the child to observe and use in order to maintain a high level of interest.

Young children learn by doing and this should be kept in mind when preparing a curriculum program for them. In the preoperational stages of development the young child needs to have as many experiences as can be provided in order to make the learning experience a successful one. Abstract concepts should not be taught at this stage without having many experiences provided for the child first (Smith, 1981). The young child may be limited in what concepts he can grasp, but that does not mean that there is a limit to his curiosity, imagination, or eagerness to learn.

The Learning Environment

" Experiences in science not only satisfy children's curiosity and interest, but also are the best vehicle for helping children make that important transition from thinking that is perception-bound, egocentric, and illogical to thinking that is flexible, logical, reversible,

and capable of conserving " (Neuman, 1972 cited in Smith, 1981, p.6). A child who has direct experiences with his environment learns to observe, predict, classify, and communicate. Smith (1981) concludes that an early childhood science program should be centered around the child and involve many hands on activities. He should be allowed to explore at his own pace and according to his own cognitive abilities. He should be encouraged to think aloud and talk about what he is observing. In this type of environment, children will engage in experiences that help to develop logical and systematic thinking in addition to learning science.

Bredderman (1983, cited in Blosser,1986) stated that if elementary school science programs were activity-based, student performance on tests of science process, creativity, and maybe intelligence would show increases; reading and mathematics scores might also increase; and attitude toward science class would show improvement. Bredderman (1983) continues by saying "The accumulating evidence on the science curriculum reform efforts of the past two or three

decades consistently suggests that more activity-based approaches to teaching science result in gains over traditional methods in a wide range of student outcomes at all grade levels" (p.513).

Research on Inquiry Based Science Programs

A study conducted by Renner and associates (1973) tested the effects of a science program that was inquiry based as being an effective reading readiness program. The study was conducted from September, 1968 until May, 1971. The science program used was SCIS. The students who were in the control group used a commercial reading readiness program while the experimental group used the "Materials Objects" unit and experienced no reading readiness program.

The Metropolitan Readiness Test was used as a pretest and a posttest. The experimental group showed greater gains than the control group in the total score and in all subtest areas except copying. The gains made by the experimental group in the areas of Word Matching, Listening, Matching, and Numbers were achieved because the children were allowed to have concrete experiences

in each of these areas to the limit of their interest and ability. The children were able to match because of their experience of matching properties to objects with which they worked. They developed listening skills because of the interaction among students. They had to describe, classify, and discuss their experiences with each other. They learned word meaning as the teacher would help them describe what they were observing. The children had to order objects or groups of objects and thus learned number skills. The children were outgained on the copying because they did not do much copying; instead they were given time to think about all they experienced. The author offers no explanation for the superior gains made by the experimental group on the alphabet subtest (Renner, 1973).

Integration of Science and Reading

It seems logical to teach reading while teaching social studies and science rather than during independent reading instruction. The idea of integrating reading instruction with subject matter is not new, but unfortunately it does not

occur often (Anderson, 1985, cited in Butzow, 1988).

"Research in the area of science education concludes that the elementary school must capitalize on the integration of science with other subjects to help students learn how to become critical thinkers and decision makers " (Gates, Krockover, & Wiederman, 1988, cited in Butzow, 1988, p.3). Problem solving exercises deal with content area: therefore, process skills cannot be taught independently from subject matter (Hodson, 1988, cited in Butzow, 1988).

The Science, Technology and Society Movement

" The Science, Technology and Society movement is a means of integrating various subject matter disciplines as well as process skills. The purpose of STS is to empower learners to make judgements about the use of science and technology in their daily lives " (Butzow, 1988, p.4). It helps students to further develop their problem solving skills because they are asked to make choices after analyzing situations.

With technology being as important as it is to society, it is crucial that students (our

future leaders) become scientifically literate. To be scientifically literate is not simply being able to read scientific information but also to understand and be able to discuss what you have read. At some point in their future, these students will be making decisions regarding technology. They need to understand what technology can and cannot do (Butzow, 1988).

It makes sense to begin STS instruction in elementary school. Children at that age have a natural curiosity as to how things work and often choose science as their favorite subject (Stake, 1979, cited in Butzow, 1988). In most elementary schools, the self-contained classroom is most popular. This situation lends itself to integrating various subjects.

Research shows that teachers unfortunately feel inadequate in science instruction and therefore limit the amount of time they spend in this subject area. They also feel there is not enough time to teach science and therefore science instruction continues to decrease (Gates, 1988, cited in Butzow, 1988).

A simple way to include STS instruction in elementary school is through children's literature. Language arts is very much stressed during the day and up to half the school day is spent in this area. Many teachers are confident and feel comfortable with language arts instruction. If the teacher integrates STS units with language arts and reading instruction, no teaching time in the area of reading is lost. Instruction time is maximized and the teacher provides a much more natural setting to teach these subjects. The teacher is no longer teaching reading in isolation but along with content matter in the various disciplines (Butzow, 1988).

This may begin in kindergarten and continue up through the grades. Reading stories is a very important part of the young child's day and it makes sense to make it as meaningful as possible. There is a great deal of good children's literature available on all levels. If teachers use books that children enjoy, they will listen and retain what they have heard. Learning isolated facts does not remain long with the child and has very little meaning to him. "By using

children's literature as a basis for learning about an issue which affects all society, many areas of knowledge have been integrated. In doing so, educators will achieve the objectives of helping children develop the problem solving and communication skills that they will need for the future" (Butzow, 1988, p.8).

Smardo (1982) stated: "Children's books that deal with science concepts can help young children make the difficult distinction between what is real and what is imaginary " (p.267). The following is an example of factual information that may seem ficticious to the young child. Fish is Fish by Leo Lionni is a story of a tadpole that changes into a frog. The child who is unfamiliar with this does not know if it is fact or fiction. This story lends itself well to class discussion of what is real and what is pretend. The story sparks interest in children to further explore this concept. An experience in class can precede the story as well. Tadpoles could be in an aquarium and the children could observe how they change. The story could be read after the class has made their observations.

Fiction as well as non-fiction books can be used to teach science concepts. Cloudy with a Chance of Meatballs by Judith Barrett is a story about school being closed because it rained pancakes and maple syrup. Young children are aware that this cannot happen, but can other weather conditions close school? This could lead to a discussion about severe weather conditions (Smardo, 1982).

Children's literature can enhance a science lesson. It can stimulate good discussion and arouse further interest. It can also support what has been taught or demonstrated. It cannot take the place of direct science experiences. "The need for this type of complementary relationship is clear in light of data from the National Survey of Science, Mathematics, and Social Studies Education that reveals that on the average, U.S. teachers in grades K-3 spend only 17 minutes a day on science" (Rowe, 1980; Weiss, 1977 cited in Smardo, 1982, p.268).

The learning environment is very important in education. Books can add to this environment by allowing children to have vicarious experiences in

addition to hands on exploration. This type of science program is not difficult to implement. Materials are made available to students for exploration through guided discovery. A class library displaying books dealing with the science concepts being taught can help children to see how science fits into their everyday lives (Dole & Johnson, 1981). Smith (1981) said, "In this type of environment, children can explore at their own pace, ask questions, make predictions, share viewpoints, and develop logical thinking skills" (p.9).

There is evidence, too, that an early childhood program of this type has positive results. In a year long study, children who were involved with the science based curriculum demonstrated an increase in their self-directed discovery as well as asking more questions than those children in the control group (Iatridis, 1981).

Middle and high school programs can also benefit from a science program that incorporates literature. Even though hundreds of books are published at this level each year, many of these

students are exposed only to their science textbooks. One of the reasons is that the publishers unfortunately send the literature advertisements to reading teachers and media specialists omitting the science teacher (Dole, 1981).

Using literature in the science program is a viable alternative. Many young people are unable to read the required text and many others find it boring and irrelevant (Dole, 1981). Reading about content information should be covered in a way relating to everyday life. Reading paperbacks or short stories dealing with the curriculum not only accomplishes this but can also be enjoyable. Students can also gain additional information, adding to what they have learned in class.

Martin (1988) states that there is "the need for presenting science to children in a way that helps them to make associations and to see relationships among the facts they are studying. Children have a natural inclination to animate the world in order that they may more easily bring their own experiences to bear upon it" (p.255). Martin feels the way to accomplish this is to

present science as a story rather than the more traditional expository mode. In the expository mode the teacher conveys information then explains it. To present science as a story the teacher becomes the narrator and gives a detailed account of what happened and how the events occur.

People close to nature have been doing this for hundreds of years. Farmers and sailors are very astute to how the world changes. For years these people have made up stories to explain what is happening around them. This form of literature is known as weatherlore. Children can listen to some of these stories and then observe what they actually see. Observation is fundamental in science (Martin, 1988). A child who observes through his own experiences will be more likely to remember what has happened than the child who is given a set of isolated facts. Martin (1988) states "Through a story telling mode, scientific knowledge can be kept alive for children. The challenge, however, is to find enough storytellers" (p.259).

The Language Experience Approach

The Language-Experience Approach (LEA) incorporates using literature in a science curriculum. This approach lends itself well to a typical classroom setting. In a typical classroom, there are students with a variety of skills and abilities. Some of these students read well above grade level, while others may be below grade level. If a science textbook is available, it may be too hard for some and not challenging enough for others. "Based on the premise that experience is the best way to learn to read, LEA complements programs that stress hands-on or laboratory experiences" (Lawrence, 1984, p.103). The poor reader as well as the good reader can experience success in this type of learning environment.

The basis of LEA is that what a student thinks about he can talk about, and what he can talk about he can present by drawing, writing, or some other form of expression. Anything the student writes he can read (Lawrence, 1984).

LEA can be broken down into five main steps.

The first step is providing the stimulus or motivation. There are a number of ways this can be done in a science curriculum. Books are great motivators. They arouse interest and the need for further exploration, and many times they provide something the students can relate to. Experiments and hands on activities are also used as stimuli. The second step is brainstorming. Ideas are discussed freely as well as approaches to problem solving. The teacher is the guide allowing students to discover phenomena. The third and fourth steps involve writing by the teacher or student. The students can dictate their thoughts as the teacher records them or the students can write their own ideas down. In either case, the students then read what was written. At a later date this rough draft can be revised and edited. The final step would involve working with what was written. The students could get their spelling words and/or vocabulary words from their writing. Grammar lessons could be taught using this same text. These are just a few objectives that could be covered from this lesson. There are many more

depending on what the teacher's goal is (Lawrence, 1984).

A student who actively participates in his education will more likely find meaning to what is being taught. Morgan (1977) states that "science has been redefined from that of a body of knowledge to that of an active interaction with objects and events within the environment... observing, measuring, collecting and interpreting information, and formulating and testing hypotheses" (p.135).

Today there is deep concern for getting back to basics. The basics usually refers to the basic skills in reading, writing, and arithmetic. In many school systems other subject areas have been eliminated to provide more time for these basic subjects. There are science teachers who feel that this opens the door for science to come back into the curriculum. They believe science content could be taught while teaching reading and mathematics (Morgan, 1977).

Two important facts relating to the development of basic skills are "the fundamental processes involved, and how children learn"

(Morgan, 1977, p.135). Printed words take on meaning to the young child only when the child can relate to what is printed through his own experiences. One can infer then that a child must have a series of experiences from which to draw before he can learn to read. The teacher can provide additional experiences in the classroom to add to what the child already has. With these experiences the teacher can develop reading and other communication skills. If experiences are not provided, the child may lose interest and not continue to develop the necessary reading skills to become a successful reader.

Jean Piaget developed a theory regarding intellectual development that has important implications in education today. Morgan (1977) states that Piaget's theory "suggests that the processes develop in a sequential pattern with qualitative differences evident at each stage in the sequence. Furthermore, according to the theory, one major source of learning is the intrinsic activity of the learner" (p.136). This means that the child must have experiences with concrete materials and events in his environment

in order to understand them. In addition to these experiences the child must also interact with adults and other children.

Activity-Centered and Inquiry-Oriented Science

Ginsburg and Opper (cited in Morgan,1977) draw three implications from Piaget's theory: (1) in order to learn, the child must work with concrete objects and experience events in his environment; (2) these objects and experiences must be at the learner's intellectual level and in proper sequence; and (3) the opportunity must be provided for interpersonal interaction. If the above implications are valid for learning to read, then it makes sense to intentionally provide opportunities for concrete experiences, interaction with others during these experiences, and creating verbal, oral, and written descriptions of these experiences. Therefore learning to communicate would be an important part of this program.

Morgan (1977) states "an activity-centered and inquiry-oriented program in science based upon Piagetian learning theory, would contribute significantly to the development of reading and

other communication skills" (p.136). Morgan cites two studies that test this assumption.

Neuman (cited in Morgan, 1977) conducted the first study which invloved first grade students. He concluded that the students involved with this type of curriculum demonstrated a higher level of reading achievement than the students not involved with this curriculum.

Renner (cited in Morgan, 1977) conducted a similar study and found that "children who have had an inquiry experience seem to use the higher processes of thinking more effectively than those who have not experienced inquiry" (p.137).

There is a great deal of evidence to support the idea that the motivation of a student and the student's interest in a task affect the outcome of that task. It was noted that students not only were developing process skills, but also communication and peer interaction skills. All of these are important components of the learning process (Morgan,1977).

Summary

The research presented here supports the importance of a hands on, experience approach to

science. Research also indicated how teachers could use literature to facilitate this type of program. A literature based curriculum is enjoyed by both teachers and students, is logically sound, and has evidence of proven success.

SECTION III

METHODOLOGY

Overview of the Study

This chapter describes the methods used in this research study. The hypotheses are stated and the instrumentation is described. The sampling technique, experimental design, and statistical analysis of the research study are also described.

Statement of the Hypotheses

This study is designed to test the following null hypothesis at the .05 level of significance.

H_O: There is no significant difference in science achievement for kindergarten students who are taught science concepts using children's literature and those who are not. The following is the research hypotheses:

H_R: There is a significant difference in science achievement for kindergarten students who are taught using children's literature and those who are not.

Instrumentation

In this study a teacher-designed test was given to the experimental and control groups as a pretest and a posttest. The test consisted of 8 questions which were given orally by the teacher. Each student was tested individually. Each appropriate response was 1 point for a total of 8 points if all questions were answered correctly. The student was not limited to a time period but probing questions were asked to elicit a response. The eight questions included science concepts that were listed as the objectives of the science unit.

See Appendix A for copies of the test.

Sampling Technique

The subjects for this study were 48 kindergarten students in two intact classes. The sample contained 22 girls and 26 boys. Five students came from one-parent homes, while the remainder lived with two parents. The sample consisted of 33 whites, 7 blacks, 6 Mexicans, and 2 Indians. 12% received either free or reduced lunch rates.

The academic levels of these students vary slightly. The majority are on grade level based on the Gwinnett County Assessment Test which is administered to all kindergarten students in the county.

The 48 students were arbitrarily assigned to two classes at the beginning of the year. The classes were similar in academic levels as well as socio-economic background. They were left intact for this study. The experimental class had 24 students and received the treatment. The other class was the control group which had 24 students.

The experimental and control groups were given the same pretest. The experimental group received instruction which included children's literature. The control group received the same instruction by teacher directed class discussion. Children's literature was not used with the control group. Both groups received this type of instruction for three weeks and were given the same posttest at the end of the treatment. The gain scores were used to compare the two methods of instruction.

Experimental Design

The design in this study was a Nonrandomized Pretest-Posttest Control Group Design. The design is shown in Table 1.

Table 1

Nonrandomized Pretest-Posttest Control Group Design

Assignment	Group	N	Pretest	Treatment	Posttest
NR	E	24	X_1	L	X_2
NR	C	24	X_1	T	X_2

N: Number of subjects in sample

NR: Nonrandomized assignment

E: Experimental group

C: Control group

L: A teaching method using children's literature

T: A teaching method using teacher guided class discussion.

X_1: Pretest to measure any knowledge of subject area

X_2: Posttest to measure gain in knowledge of subject area

Procedures

The experimental and control groups in this study received treatment for three weeks during the fall quarter. Each class received instruction for 1 to 1.5 hours. Approximately 15 to 30 minutes was spent in large group instruction and the remaining 45 to 60 minutes was spent in small groups working at centers. Both groups were given the pretest the week before instruction began (see Appendix A). The researcher taught the experimental group while another kindergarten teacher taught the control group. The researcher would introduce the day's lesson by reading a children's story. The control group began their lesson with a discussion led by the teacher. Both teachers used the same lesson plans except the control group did not listen to the children's literature. Related activities followed the opening of the lesson. There were several art activities, science experiments, and creative writing lessons. The same science concepts were taught in both groups and both groups participated in the same follow-up activities. The students were introduced to this unit by learning about the

different life forms that are present in the ocean. During the three-week period they learned about shells, starfish, tadpoles, survival, salt water, hurricanes, and transportation, (see Appendix B). Both groups were given a posttest.

Statistical Analysis Procedure

To test the hypothesis formulated for this study, gain scores from the pretest and posttest were collected from the control and experimental groups. Data was analyzed by using a two-tailed *t*-test at the .05 level of significance.

SECTION IV

RESULTS

Summary

There were 48 kindergarten students who participated in the three-week study comparing two methods of teaching science. There were 24 students in the control group and 24 students in the experimental group. Both groups were administered an eight-item pretest on the first day. The control group received regular instruction with teacher guided discussion. The experimental group received the same instruction but included the teacher reading children's books related to the topic of discussion. Both groups were given the posttest at the end of the three-week period. The total gain scores for the control group were 88 for 24 students with a mean gain score of 3.67. The total gain scores for the experimental group were 74 for 24 students with a mean gain score of 3.08. A *t*-test was done to compare the gain scores in achievement. A summary of the statistical results in achievement is

Table 2

t-Test Results in Achievement

Group	N	$\bar{X}$	s	t
E	24	3.08	1.46	1.51
C	24	3.67	1.31	

The acceptance of the null hypothesis in achievement was determined at the .05 level of significance with 46 degrees of freedom. The calculated t of 1.26 was less than the critical t of 2.021. Therefore, the null hypothesis was not rejected.

Conclusions

There was no significant difference in science achievement of students who were taught science concepts using children's literature and students who were taught science concepts with teacher guided discussions. The results indicated that the children's literature did not help the students score higher on the posttest.

Limitations

This study had the following limitations:

1. The duration of the study was limited to three weeks.
2. Kindergarten is the first school experience for some of the students. Since this study was carried out at the beginning of school, many students are becoming familiar with school.
3. Routines are set at the beginning of school and many students were still learning them.
4. The same teacher was not able to teach both groups in the study.

Discussion

The experimental and control groups were very enthusiastic about studying oceans. Looking at the pretest scores of the experimental and control groups, neither group had a strong background in this subject area. Both groups were very eager and responded well to the science unit taught.

There wasn't a significant difference in the posttest results of the two groups. The posttest

was given at the conclusion of the unit studied. If a second posttest was given over a period of time, retention of the material learned might become a significant factor.

The researcher was not able to teach both groups. The researcher taught only the experimental group and did not observe how the control group was taught. Therefore, lesson plans may not have been carried out as planned.

Implications for the Classroom

Although the study did not indicate higher scores using children's literature, the students enjoyed listening to the variety of stories. They would come in each day eager to hear another story about the ocean. Their enthusiasm for books was very obvious.

Enthusiasm for literature was not measured but is an important factor. The researcher suggests using children's books to teach science concepts as a way to have children develop an appreciation for literature.

Implications for Future Research

The researcher reviewed studies that indicated positive gains with students who were taught science concepts with children's literature. This study was a short one and the results might be different if it were carried out over a longer period of time.

Retention of material for a given length of time was not measured. Future research should measure this to see if there is a difference in scores as a result of teaching methods.

Enthusiasm was very high in both classrooms. The children were extremely enthusiastic. Was this because of the material being taught or did teacher enthusiasm play a part?

The experimental group developed a strong affection for books and were very eager to listen to new stories. This enthusiasm should be measured in future studies also.

It is possible that this study was not long enough to draw any firm conclusions. There is a definite need for further similar studies to answer some of the questions that have been raised.

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APPENDIX A

SCIENCE PRETEST/POSTTEST

I have found these measuring instruments to be valid and reliable measures of the science achievement level of kindergarten students.

Diane Rankin, Ph.D.
First grade Teacher

Carolyn H. Fisher
Kindergarten Teacher

Grade K Pretest/Posttest

Name_____ Date_____

This exam is given orally to individual students.

1. Using a globe the teacher says, "The globe represents areas that are water and areas that are land, point to three different land areas on the globe. Now I would like you to point to three different bodies of water."
2. Is there more land or water on our earth?
3. Would lake water taste the same as ocean water? Why/Why not?
4. Why are there waves in the ocean?
5. Where do shells come from?
6. What can you find inside a shell?
7. If you wanted to travel across the ocean, what type of transportation would you use? Any appropriate means of transportation is accepted. Plane, boat, ship, etc. are acceptable but car would not be acceptable.
8. Why is it important to take care of our lakes, rivers, and oceans?

Scoring System for Pretest - Posttest

Number of Points	Observed Characteristics
0	- No answer given
	- Incorrect answer given
1	- Appropriate response given

APPENDIX B

SCIENCE UNIT

Oceans

Objectives of Unit:

1. To distinguish between land and water using a globe.
2. To describe characteristics of the ocean such as salty, shells, waves, sand, ocean floor, size, and tides.
3. To identify ocean life such as plants, animals, and fish.
4. To list the ways the ocean helps us which includes transportation, food, jobs, and recreation.
5. To understand why ecology is important.

Experimental Group

First session

Introduce the ocean unit by reading Exploring the Seashore by H. Amos. The students will learn about the different life forms in the ocean. Have a group discussion following the reading.

Summarize by listing many of the life forms found in and around the ocean. Discuss the characteristics of the ocean. Show the class a globe and discuss the areas that are land and those that are water.

Follow-up Activities

1. Fish prints: Cut styrofoam meat trays into flat 5 inch squares. The students use pencils to carve an ocean picture. Using ink and a brayer, roll blue ink over styrofoam. Press painted side down on white construction paper. Have students write about their picture.
2. Cheerioctopus: Draw an octopus on 8x11 paper. Run off one copy per student. Have each student fill in the tentacles by gluing cheerios in spaces.

3. Crab puppet: Make a pattern of a crab 6"x5". Have students trace and cut out. They glue this on a brown bag to create a puppet. Students put on a puppet show.
4. Seascape: Students will draw fish and cut them out. The glue them on large blue plastic plates. Cut out small green strips of paper to represent seaweed and glue these on too. Using yellow construction paper, cut out a ring to go along the outer edge of the plate. It should now look like a porthole.

Second Session

Read Shells Are Skeletons by Berg Victor. The children will learn about mollusks. Set up a display of a variety of shells. Have the children bring in shells that they might have and add these to the display.

Have a discussion about shells. Include the many different types of shells that are displayed. Talk about what lives in these shells. Where are these animals now? Where do we find these shells?

Follow-up Activity

1. Display various shells and the books Shells are Skeletons by J.B. Victor and Discovering

Seashells by D. Florian. The students examine the shells and try to find them in the books that are displayed.

Third Session

Read Starfish by Edith Thacher. After reading the story display a dried starfish. Discuss some of the facts the students heard in the story. How does a starfish move? How does it get its food? What happens if a starfish loses its ray?

Follow-up Activity

1. Cut out starfish using 8x11 manilla paper. Scrape colored chalk into a large pan filled with 2 inches of water. The scrapings will float on top. Have each child lay his paper on top of the water and then lift it out.

Fourth Session

Read Fish is Fish by Leo Lionni. After the reading discuss why the fish need water to live. Talk about the changes a tadpole goes through in order to become a frog.

Follow-up activity

1. This science experiment illustrates water pollution. Fill several jars with pollutants

(oil, charcoal, detergent, and water). Display these for the class to see. Discuss how clean water is different than dirty water. List all the reasons why we need to take care of our water supply.

Fifth Session

Read Swimmy by Leo Lionni and follow the reading with a class discussion. Talk about the dangers of the ocean and how fish survive.

Follow-up Activities

1. Cut out several different size and shape fish. Have the children color them using bright bold colors. Cover these with black tempra paint. When the paint dries the children scratch out a design.
2. Fill a tall, thin bottle with half water and half cooking oil. Add a few drops of blue food coloring. Close it with a tight lid. Turn the bottle on its side and tilt it back and forth slowly. This gives the illusion of a wave. Discuss the way waves are created in the ocean. Wind is the primary cause.

Sixth Session

Read From Sea to Salt by Ali Mitgutsch. The students will learn how salt is extracted from the sea. They will see the different jobs involved in this process.

Follow-up Activity

1. Mix a little salt in some water and pour it into paper cups. Let children taste the salt water.

Seventh Session

Read Do Not Open by Brinton Turkle. This is a children's mystery book dealing with storms at sea. Have class make a jot list of what happens after a storm at sea. Have children do a creative writing lesson about this book. Some things to write about are: 1. What does the beach look like after a storm?; 2. Should Miss Moody open the bottle and why?; 3. Change the ending of the story.

Follow-up Activities

1. Make sea shell necklaces. Flatten a piece of clay to half an inch. Use a glass to cut out a circle from the clay. Take a small shell and press it into the clay. Lift the shell

and it should leave an impression in the clay. Use a pencil to poke a hole near the top of the clay. Allow it to dry overnight.

2. Make a worksheet using pictures of sanddollars in several sizes. Have the students cut these out and glue them on a separate sheet of paper in size order.
3. Make a worksheet using various pictures of clothing and accessories. Children circle the items they might take to the beach.
4. This is a food activity. Spread blue cream cheese (add food color to the cream cheese) on a slice of bread. Put a fish cracker (Pepperidge Farm) near the bottom and use cheerios for bubbles.

Eighth Session

Discuss transportation on water. Talk about what types of transportaion would be appropriate and why.

Follow-up Activities

1. Make rafts using popsicle sticks. Glue ten sticks together and brace with two sticks cross ways. Place a paper souffle cup on top of the ten sticks and glue it down.

2. Make a submarine pattern. Have children trace and cut it out. Use construction paper.

Control Group

The lesson plans are the same for the control group and the experimental group except children's literature was not used with the control group. The teacher would discuss the concepts of each lesson and follow the same format of the lessons of the experimental group.

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APPENDIX C

DATA

Experimental Group - Achievement

Pretest	Posttest	Gain Score
0	6	6
0	4	4
1	8	7
1	1	0
1	5	4
1	5	4
1	5	4
1	6	5
2	8	6
2	6	4
2	6	4
2	5	3
3	7	4
3	2	-1
3	5	2
4	7	3
4	4	0
4	7	3
5	6	1
5	7	2
5	8	3

6	8	2
6	8	2
6	8	2
68	142	74
$\bar{X} = 2.83$	$\bar{X} = 5.92$	$\bar{X} = 3.08$
		$s = 1.95$

Control Group - Achievement

Pretest	Posttest	Gain Score
1	5	4
1	5	4
2	8	6
2	7	5
2	3	1
2	8	6
3	8	5
3	7	4
3	7	4
3	8	5
3	6	3
3	7	4
4	8	4
4	7	3
4	7	3
4	8	4
4	7	3
4	8	4
4	7	3
4	8	4
4	8	4
5	7	2

5	7	2
7	8	1
81	169	88
$\bar{X} = 3.38$	$\bar{X} = 7.04$	$\bar{X} = 3.67$
		$s = 1.31$

Summary of Achievement Posttest Scores

Posttest Scores	Number of Students
8	16
7	14
6	6
5	7
4	2
3	1
2	1
1	1
0	0

APPENDIX D

STATISTICAL ANALYSIS

Science Achievement

Group I-Control	Group II-Experimental
$n_1=24$	$n_2=24$
$\bar{X}_1=3.67$	$\bar{X}_2=3.08$
$s_1=1.31$	$s_2=1.95$
$s_1^2=1.72$	$s_2^2=3.80$

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1 + n_2 - 2}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$t = \frac{3.67 - 3.08}{\sqrt{\frac{(24-1)\ 1.72 + (24-1)\ 3.80}{24 + 24 - 2}\left(\frac{1}{24} + \frac{1}{24}\right)}}$$

$$t = \frac{.59}{\sqrt{\frac{39.56 + 87.4}{46}\left(\frac{2}{24}\right)}}$$

$$t = \frac{.59}{\sqrt{(2.76)\ (.08)}}$$

$$t = \frac{.59}{\sqrt{.221}} = \frac{.59}{.470} = 1.26$$

Since $1.26 < 2.021$, the H_o is not rejected.